SHORT RESUME/ SYNOPSIS OF PH. D TOPIC

Entitled

"STUDIES ON BIOCHEMICAL COMPOSITION AND NUTRITIONAL PROPERTIES OF FRESHWATER FISH *LABEO ROHITA* FROM NANDED, (M.S.)"

Submitted to

THE FACULTY OF SCIENCE AND TECHNOLOGY, SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED – 431 606 (M.S.) INDIA.

For the Degree of

Doctor of Philosophy in Zoology

• BY •

MS. WANKHEDE SHARDA NARAYAN
M.Sc.
(RESEARCH SCHOLAR)
Department of Zoology,
Yeshwant Mahavidyalaya,
NANDED - 431 602, (M.S.) INDIA.

• UNDER THE GUIDANCE OF •

DR. MRS. MANGAL SITARAM KADAM
M.Sc., M.Ed.,Ph.D., F.S.L.Sc..
(Research Guide in Zoology),
Professor in Zoology,
Department of Zoology (UG & PG),
Yeshwant Mahavidyalaya,
NANDED - 431 602, (M.S.) INDIA.

MAY – 2023

SYNOPSIS OF PH. D. TOPIC

STUDIES ON BIOCHEMICAL COMPOSITION AND NUTRITIONAL PROPERTIES OF FRESHWATER FISH *LABEO ROHITA* FROM NANDED, (M.S.)

Brief Resume:

India is third largest fish producing country and the second largest aquaculture fish producer in the world. India contributes about 7% to the global fish production. The country is also home to more than 10% of the global fish diversity and is on of the 17-mega biodiversity rich countries. Around 14 million people are engaged in fisheries and its allied activities. Fish farming in India is rapidly growing because fishes are a good source of nutrition, they are affordable, and this have a huge supply in Indian counterparts. India is the 2nd largest fish producer after China, through aquaculture. Fish is a staple dietary source in most Indian states. Almost 60% of Indians consume fish in their diet. The increase in consumption of fish is resulting in an increase in India fishing industry. Largest fish producing states in India, Andhra Pradesh is the largest fish producer in the country followed by West Bengal, Gujarat, Kerala, Tamil Nadu, Goa, Daman, Diu, Puducherry, Odisha, Karnataka and Maharashtra (M.S.).

Fish is often referred to as “Rich food for poor people” as it provides essential nourishment with both macro-nutrients and micro-nutrients. Fish contain low-fat-high-quality protein with omega-3 Fatty acids and vitamins. Fish is rich in calcium and phosphorus and a great source of minerals such as iron, zinc, iodine, magnesium and potassium.

Labeo rohita or rohu fish is a carp that is mostly found in rivers and ponds. Rohu is a column feeder, and due to the way it feeds, it is often cultivated along with two other carps – *Cirrhina mrigala* (bottom feeder) and *Catla catla* (surface feeder). The rohu is a large, silver-colored fish of typical cyprinid shape, with a conspicuously arched head. Adults can reach a maximum weight of 45 kg (99 lb) and maximum length of 2 m (6.6 ft), but average around 1⁄2 m (1.6 ft. Rohu is rich in Omega 3 fatty acids, Vitamin A, Vitamin B and Vitamin C. It is also rich in Vitamin D, a Vitamin which is present only in a few foods and consumption of the fish will prevent Osteoporosis, a Vitamin D deficiency disease. For that reason, the present work is proposed to investigate the Studies on Biochemical Composition AND Nutritional properties of Freshwater fish *Labeo rohita* from Nanded, (M.S.).

Introduction:

Fish and fish products have presently emerged as the largest group in agricultural exports from India, with 13.77 lakh tones in terms of quantity and Rs. 45,106.89 crore in value. Fishing

production in India is the largest globally. The income opportunities and profitability are quite huge in India.

Fish is cold-blooded aquatic organism that breathes with gills and swims with fins. They are categorized as fin fish and shell fish. Fin fish are cold-blooded aquatic vertebrates that have gills, fins with rays and scales covering the body. Biodiversity of India has a large number of fin fish species. As per the database of the National Bureau of Fish Genetic Resources (NBGFR), Lucknow, 2508 species of native fin fish have been recorded of which 877 are from freshwater habitats.
Freshwater fish that spend most or all of their life in freshwater such as rivers and lakes, having a salinity of less than 0.5 ppt. Around 40% of all known species of fish are found in freshwater. Around 70% of India's fish production comes from inland waters, of which nearly 65% comes from aquaculture. Out of the total inland aquaculture production, Indian major carps are the most cultures freshwater fishes.

There are around 1300 carp hatcheries in India that produced seed and supply to fish farmers. Carps form the mainstay of aquaculture practices in India, contributing over 85% of the total aquaculture production, Out of 266 carp species available in the Indian region, about 34 carp species are economical and are produced mainly from capture fishery, while less than 10 carp species are produced from both the culture and capture fisheries in the country. India is called "carp country" since carps have been cultural since ancient times and been a relished delicacy in the country. The carps which are native to the Indus-Ganged River systems/ Indo-Gangetic plains of India are referred to as the Gangetic carps? Indian major carps (IMC), comprising of Catla, Rohu and Mrigal that contribute 60% of total carps production.

Review of Literature:

Fish is known to be the best and cheapest source of animal protein of very high digestibility and nutritive value. In general the biochemical composition of the whole body indicates the fish quality. Therefore, knowledge on biochemical composition of fish finds application in several areas. Due to an ever-increasing awareness about health foods, fish is finding more acceptance because of its special nutritional qualities. Fish is one of the most important components of feed for animals and human beings, because of their excellent nutritional profile and easily digestible characteristics. Precise information on the biochemical composition of fishes is necessary not only for the purpose of formulating fish feed of animals, but also for the purpose of processing and preservation of fish and fishery products for their export and other important means for human food, medicine and for industries.

Biochemical studies on fish muscles have drawn attention of several researchers at muscles are the major source of protein, lipids and carbohydrates (Joshi et al. 1979) and being the main energy reserves. The importance of such studies is to express the food value in terms of energy units (Qasim, 1972). Love later revealed the chemistry of fish in his two books namely, 'Chemical Biology of Fish (1970-1980)'. On the basis of this Love is regarded as the father of Fish Biochemistry.

The high demand for fish is not only because of its taste but also largely due to its nutritional values which is a function of its proximate composition (Njinkoue et al. 2016). It is often determined in studies of fish pathology, growth and nutrition (Copeland et al. 1999). Data concerning the chemical composition of fish is essential for providing information on nutritious healthy foods of low fat and high protein content (Mozaffarian et al. 2003, Foran et al. 2005). Fish contains 15-20% protein of its overall live body weight. The fish protein contains the essential amino acids which improve the overall nutritional quality of a mixed diet (Sujatha et al. 2013, Mohanty 2015).

The most exhaustive work on biochemical composition of fish has appeared from many countries of the world. Most notable references are those of Atwater (1888), his work covered about 53 species of American food fishes, since then considerable use of his work have been reported. It has been used by chemists and biologists. Second notable work related to the fish biochemical composition was of Clark and Almy (1918), who analyzed large number of fishes at Atlantic coast. They reported for the variation seen in the biochemical composition of fish with seasons. Love and Wood (1937) work on fat metabolism of Herring. Love later revealed the chemistry of fish in his two books namely, 'Chemical Biology of Fish (1970-1980)'. On the basis of this Love is regarded as the father of Fish Biochemistry. Biochemical studies on fish muscles have drawn attention of several researchers at muscles are the major source of protein, lipids and carbohydrates (Joshi et al. 1979) and being the main energy reserves. The importance of such studies is to express the food value in terms of energy units (Qasim, 1972).

Chandrashekar et al. (2004) studied the changes in muscle biochemical composition of *Labeo rohita* in relation to seasons and reported that moisture content was low when other constituents (fat, protein and carbohydrate) were high in *Labeo rohita* (Ali et al. 2005) conducted a detailed comparative study of body composition of different carp fish species from brackish water pond in Pakistan and reported that the body composition varied significantly among the various carp fish species in brackish water pond. The maximum moisture content was observed in *Labeo rohita* while minimum was observed in *Cyprinus carpio*. The inverse trend in body fat content was

reported among these fish species where a maximum fat was reported in *Cyprinus carpio* compared to that of *Labeo rohita*.

Objectives: -

- To study Physico chemical characteristics of Sampling Area of study.
- To study fish as a health food for human consumption and their Nutritional, Biochemical and Medicinal Values.
- To study the Biochemical aspects (Carbohydrate, Protein and Fat) of freshwater fish - *Labeo rohita.*
- To study the Moisture, Ash and Mineral contents (calcium, phosphorus, iron) of freshwater fish - *Labeo rohita.*
- To check the different nutrient levels.

Materials and Methods: -

Fishes were collected from local fish market, from different area of Nanded city. Live fishes were obtained from the local fish markets in early hours of morning. Care was taken to ensure that all fishes used for analysis were in fresh condition.

Collected fish sample with similar body lengths and weight were chosen including varies sample. Taxonomic identification was carried out with the help of standard literature (Fischer and Bianchi et al. 1984).

Biochemical Analysis: -

Ash and moisture content were measured by AOAC (2005), protein (Lowry et al. 1951), lipid (Folch et al. 1957) and carbohydrate (Dubois et al. 1956) were estimated from the fish tissue.

Importance of study:-

This study gives the knowledge and nutrient composition of freshwater fish - *Labeo rohita.*. Hence, the result is useful to the consumers in selecting the fish depending on their nutritional value. In terms of nutrition, the macro and micronutrients found in fish are suitable for human consumption (Lilly et al. 2017). Knowledge of the chemical composition of fishery products is one of the basic aspects to assess their nutritional value as well as the benefits associated with their consumption.

This study is helpful to gain knowledge of the risk and benefits associated with the indiscriminate consumption of freshwater fishes.

International Status-

Fisheries and aquaculture have been considered as an important means of poverty elevation and food security besides promoting health and wellbeing. Fish continue to be one of the most

traded food commodities worldwide. It contributes to around 17% of the global population' s animal protein intake. Around 125-210 million tonnes of fish is projected to be required by 2050 to meet the annual per capita requirement of 15-20 kg.

National status:

Fish is often referred to as "Rich food for poor people" as it provides essential nourishment with both macro-nutrients and micro-nutrients. Fish contain low-fat-high-quality protein with omega-3 Fatty acids and vitamins. Fish is rich in calcium and phosphorus and a great source of minerals such as iron, zinc, iodine, magnesium and potassium. On a fresh-weight basis, fish contains a good quantity of protein, about 18-20% and all the eight essential amino acids including the sulphur-containing lysine, methionine, and cysteine. In general, fish have less fat than red meat and the fat content ranges from 0.2% to 25%. However, fats from fatty fish species contain the pol-unsaturated fatty acids (PUFAs), namely EPA (eicosatetraenoic acid) and DHA (docosahexaenoic acid) which are essential for proper growth of children, proper brain development in unborn babies, reduced risk of pre-term delivery and low birth weight. The fat also contributes to energy supplies and assists in the proper absorption of fat-soluble vitamins namely A, D, E and K. Fish is a rich source of vitamins, particularly vitamins A and D from fatty species as well as thiamine, riboflavin and niacin (vitamins B1, B2 and B3). Vitamin D present in fish liver and oils is crucial for bone growth since it is essential for the absorption and metabolism of calcium.

Regional Status:

Fish is also called "Brain Food" as it helps in development and function of brain and "Heart Food" as it contributes to lower risks of heart attacks and strokes. Consumption of fish reduces risk of autoimmune diseases, including Type-1 diabetes, prevents and treats depression protect from age-related brain deterioration, help prevent asthma in children, protect vision in old age by lowering risk of muscular degeneration, improves sleep quality, lowers risk of cancer, blood pressure, Alzheimer's disease etc. Fish is soft, easy to cook and more easily digested than meat. So even young children can be fed fish, contributing to improved nutrient intake. For that reason, the present work is proposed to investigate the Studies on Biochemical Composition of Freshwater fish *Labeo rohita* from Nanded, (M.S.).

Scope of Study:

Fish is known to be the best and cheapest source of animal protein of very high digestibility and nutritive value. In general, the biochemical composition of the whole body indicates the fish quality. Therefore, knowledge on biochemical composition of fish finds application in several areas. Due to an ever-increasing awareness about health foods, fish is finding more acceptance because of its special nutritional qualities. Fish is one of the most important components of feed for animals

and human beings, because of their excellent nutritional profile and easily digestible characteristics. Precise information on the biochemical composition of fishes is necessary not only for the purpose of formulating fish feed of animals, but also for the purpose of processing and preservation of fish and fishery products for their export and other important means for human food, medicine and for industries.

Proposed work Plan:

First Year: Review of literature, Survey, Visit to collection sites for collection of fish.

Second Year: Collection of freshwater fish *Labeo rohita* for study of Biochemical Composition., Physico-Chemical study of Sampling area.

Third Year: Collection of freshwater fish *Labeo rohita* for Biochemical Composition. Physico-Chemical study of Sampling area.

Fourth Year: Drafting, Writing, Typing and Submission of thesis.

Outcome:

Outcomes of present study are as follows.

- To assess the nutritional status of different aspects of the edible portion of important food fish *Labeo rohita*.
- To provide reliable information about the nutrient content of freshwater fish species *Labeo rohita.*
- The data on the biochemical composition of Fresh water fish *Labeo rohita* will be essential for nutritionists for the purpose of formulating feed.
- This study provides valuable information about biochemical composition and nutritional value.

References:

Ali, M., F. Igbal, A. Salam, S. Iram and M. Athar, 2005: Comparative study of body composition of different fish species from brackish water pond. *Int. J. Environ. Sci. Technol., 2: 229-232.*

AOAC, 1990. *Official Methods of Analysis of the Association of Official Analytical Chemists. 15th Edn., Association of Official Analytical Chemists, Arlington, VA, Washington, DC., USA, ISBN-13: 9780935584424, Pages: 655.*

Bhuiyan, A.S., M.N. Islam and T. Hossain, 1992. A check list of the fishes of Rajshahi. Rajshahi Univ. Stud., 20: 287-306.

Bligh, E.G. and W. Dyer, 1959. Total lipid extraction and purification. Can. *J. Biochem. Physiol., 37: 99-110.*

Eswaran Rangasamy , Palanisamy Sundarabalan ,Muniasamy Muniyandi 2021. Comparative Analysis of Nutritional value of *Catla Catla And Labeo Rohita* from different lakes of Coimbatore, Tamilnadu, India. *International Journal of Creative Research Thoughts Volume 9, Issue 9 pp b674-680.*

Gheyasuddin, S., A. Rahmanand and M. Mumtazuddin, 1979. Biochemical composition of shellfishes of Bangladesh. *Bangla. J. Sci. Res., 2: 15-23.*

Hantoush, AA. Al–hamadany, QH. Al–hassoon, AS. et al.2014. Nutritional value of important commercial fish from Iraqi waters. *Mesopot J Mar Sci. 2014. 29(1):13–22.*

Khan P., N. T. Narejo, S. Jalbani, A. J. Laghari, and F. Memon, 2017. Biochemical composition of Catfish, Rita rita from Indus River near Jamshoro. *Pure and Applied Biology. 1; 6(1):47.*

Love, R.M.1970. The chemical biology of fish, Academic press. New York and London, 11(497).

Lowry, O.H., N.J. Roserrough, A.L. Farr and R.J. Randall, 1951. Protein measurement with the folin phenol reagent. Journal of Biology and Chemistry. 193: 265-275. **Mohamed, EHA, 2013.** Proximate and Mineral Composition in Muscle and Head Tissue of Seven Commercial Species of the Nile Fish from Sudan. *Asian Journal of Science and Technology. 4:62–65.*

Rajendran, M. 1973. Copepoda. In: B.G. Michael (ed.) A guide to the study of freshwater organisms. Journal of Madras University, *supplement, 1: 103-151.*

Tidwell, JH. Geoff L Allan, 2001. Fish as food: aquaculture's contribution (Report no. 11). Ecological and economic impacts and contributions of fish farming and capture fisheries. *European Molecular Biology Organization. 2(11): 958–963.*

Tsegay, T. P. Natarajan, and T. Zelealem, 2016. Analysis of Diet and Biochemical Composition of Nile Tilapia (Oniloticus) from Tekeze Reservoir and Lake Hashenge, Ethiopia. *Journal of Fisheries & Livestock Production.1-7.*

Ms. Wankhede Sharda Narayan — **Research Student**

Dr. (Mrs.) Mangal Sitaram Kadam — **Research Guide**